CHAPTER 2

DESCRIPTION OF THE LOWER TENNESSEE RIVER WATERSHED

2.1. BACKGROUND. Nickajack Dam is located about 30 miles downstream and to the west of Chattanooga, and extends 46 miles upstream from the dam to Chickamauga Dam. It was built to replace the old and leaking Hales Bar Dam. The resulting lake is located amid the spectacular scenery of the Tennessee River Gorge.

Construction of the reservoir created by Nickajack Dam began April 1, 1964 and the filling of the lake began September 14, 1967. Two days after closing the gates on the dam the lake was full. Nickajack Dam contains four hydroelectric units generating 96,000 kilowatts of electricity.

Nickajack Dam was named for Nickajack Cave located about a mile upstream.

This Chapter describes the location and characteristics of the Group 4 portion of the Lower Tennessee River Watershed.

2.2. DESCRIPTION OF THE WATERSHED.

2.2.A. General Location. The Group 4 portion of the Tennessee portion of the Lower Tennessee River Watershed is located in East Tennessee and includes parts of Hamilton, Marion, and Sequatchie Counties.

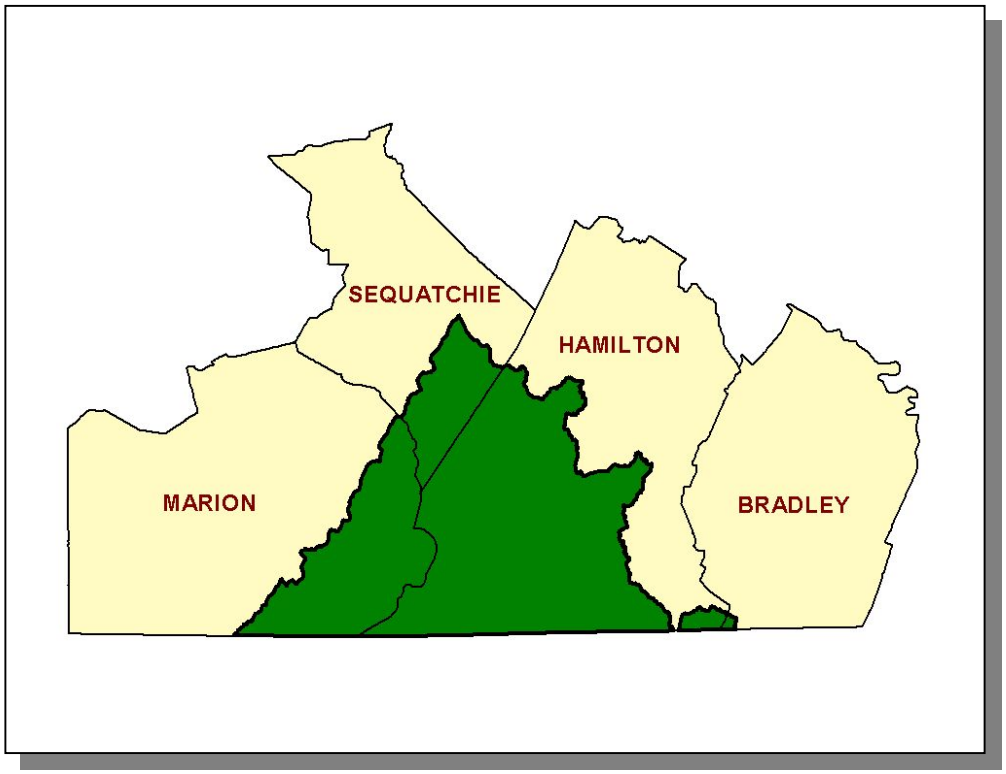

Figure 2-1. General Location of the Group 4 Portion of the Tennessee Portion of the Lower Tennessee River Watershed.

COUNTY	% OF WATERSHED IN EACH COUNTY
Hamilton	63.8
Marion	25.5
Sequatchie	10.5
Bradley	0.2

Table 2-1. The Lower Tennessee River Watershed Includes Parts of Three East Tennessee Counties.

2.2.B. Population Density Centers. Fourteen highways serve the major communities in the Group 4 portion of the Tennessee portion of the Lower Tennessee River Watershed.

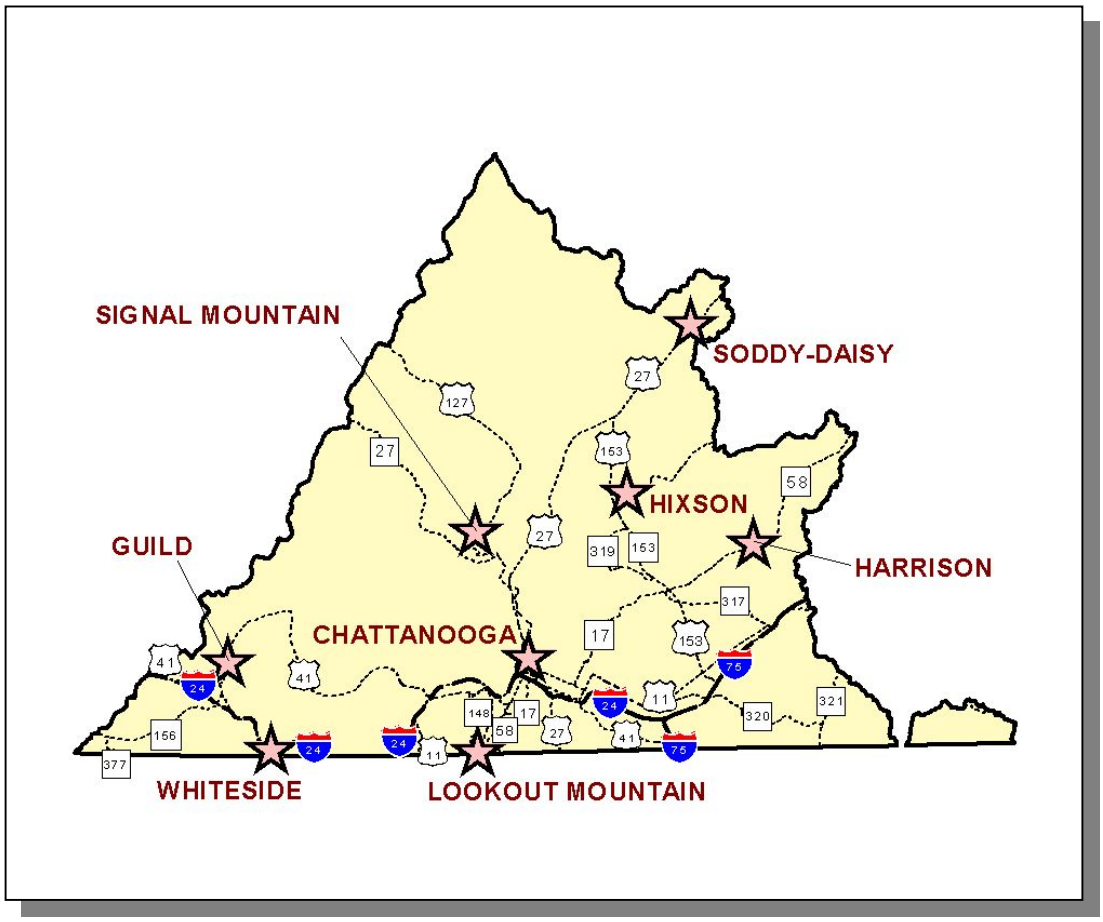

Figure 2-2. Communities and Roads in the Group 4 Portion of the Tennessee Portion of the Lower Tennessee River Watershed.

MUNICIPALITY	POPULATION	COUNTY
Chattanooga*	155,554	Hamilton
Hixson	37,305	Hamilton
Soddy-Daisy	11,530	Hamilton
Signal Mountain	7,725	Hamilton
Harrison	7,630	Hamilton
Lookout Mountain	2,000	Hamilton
Guild	764	Marion
Whiteside	355	Marion

Table 2-2. Municipalities in the Group 4 Portion of the Tennessee Portion of the Lower Tennessee River Watershed. *Population based on 2000 census (Tennessee Blue Book) or http://www.hometownlocator.com. Asterisk (*) indicates county seat.*

2.3. GENERAL HYDROLOGIC DESCRIPTION.

2.3.A. Hydrology. The Lower Tennessee River Watershed, designated 06020001 by the USGS, drains approximately 1,870 square miles, 1,201 square miles of which are in Tennessee. The Group 4 portion is 457 square miles.

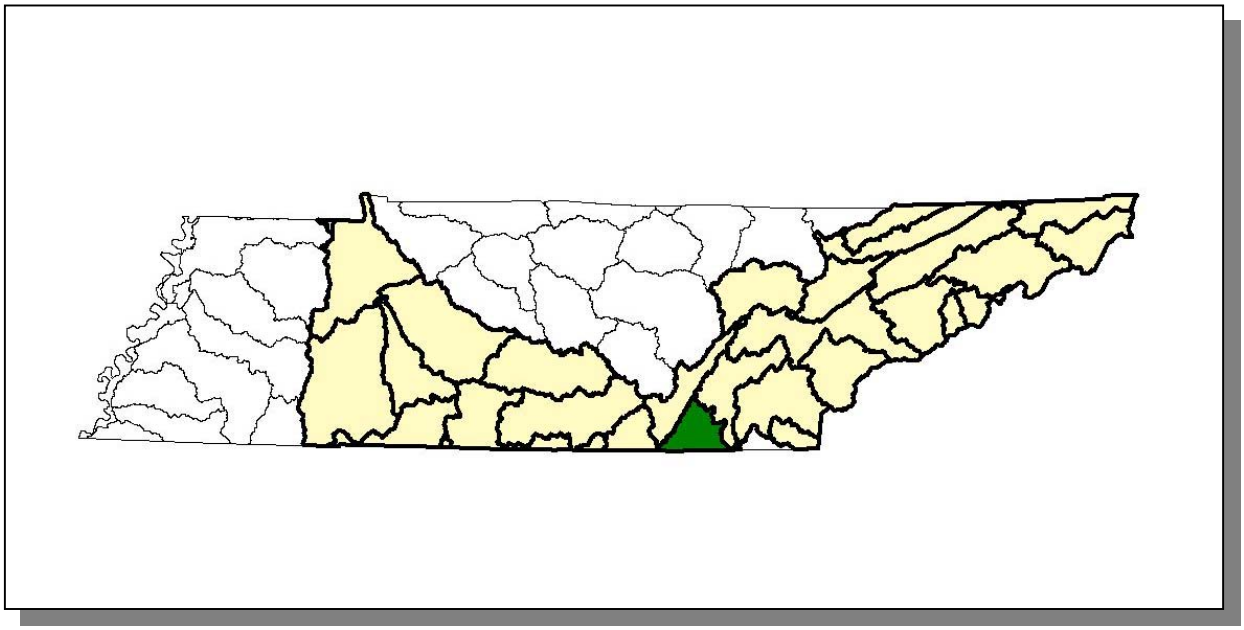

Figure 2-3. The Lower Tennessee River Watershed is Part of the Tennessee River Basin.

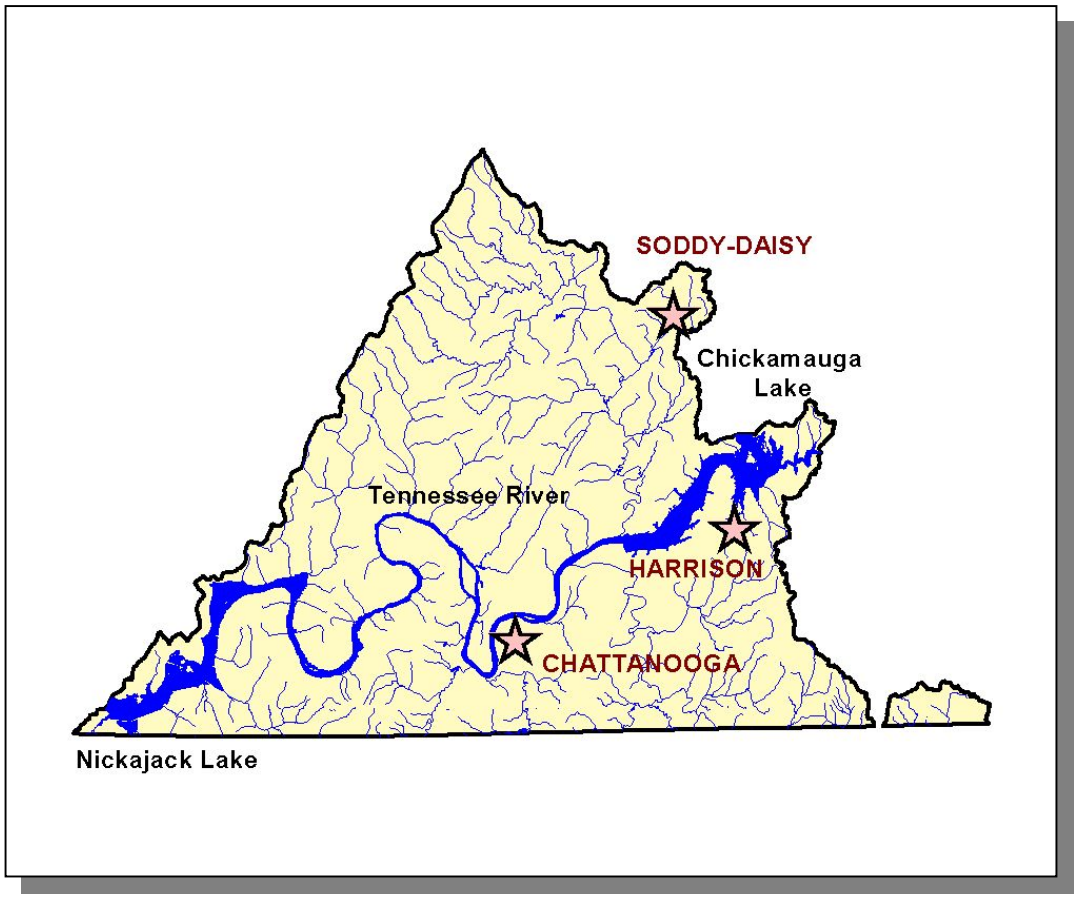

Figure 2-4. Hydrology in the Group 4 Portion of the Tennessee Portion of the Lower Tennessee River Watershed. *There are 482.6 stream miles and 10,380 lake acres recorded in River Reach File 3 in the Group 4 portion of the Tennessee portion of the Lower Tennessee River Watershed. Location of the Tennessee River including Nickajack and Chickamauga Lakes, and the cities of Chattanooga, Harrison, and Soddy-Daisy are shown for reference.*

2.3.B. Dams. There are 12 dams inventoried by TDEC Division of Water Supply in the Group 4 portion of the Tennessee Portion of the Lower Tennessee River Watershed. These dams either retain 30 acre-feet of water or have structures at least 20 feet high.

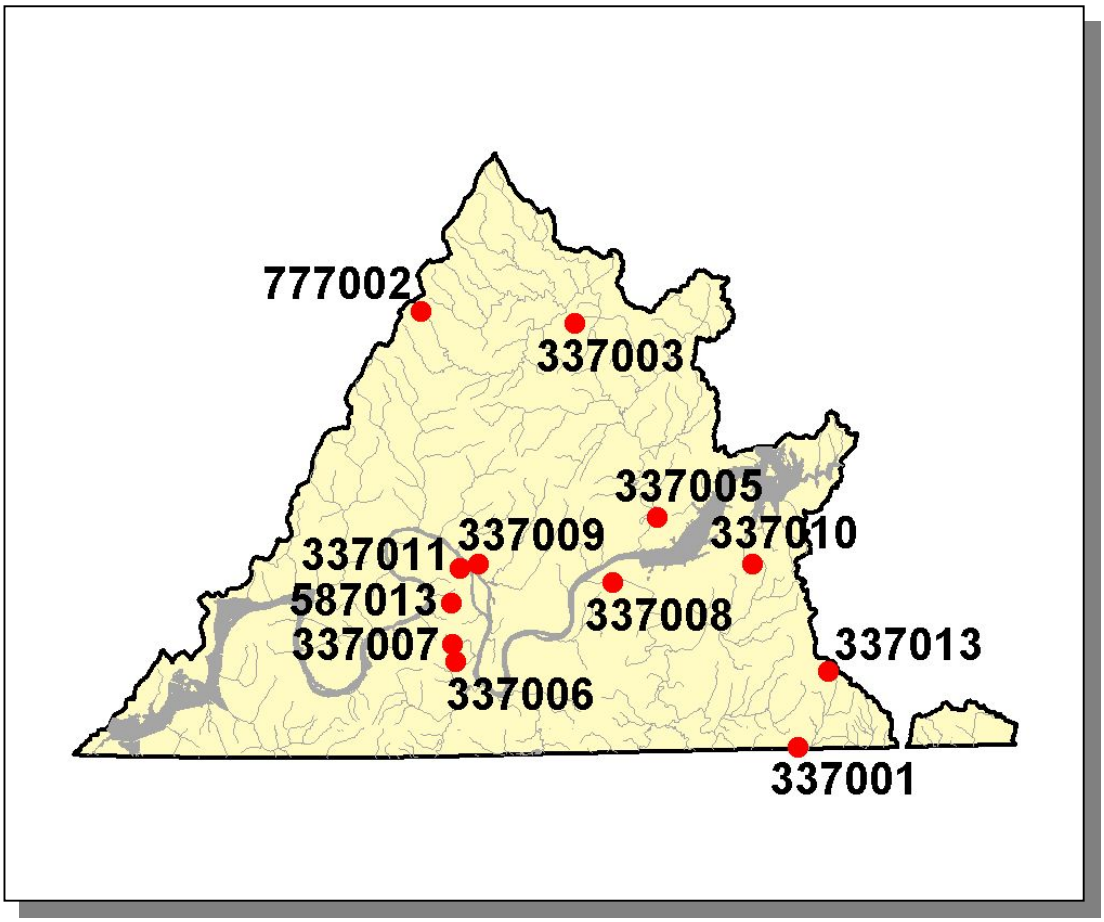

Figure 2-5. Location of Inventoried Dams in the Group 4 Portion of the Tennessee Portion of the Lower Tennessee River Watershed. *More information is provided in Appendix II and at http://gwidc.memphis.edu/website/dws/.*

2.4. LAND USE. Land Use/Land Cover information was provided by EPA Region 4 and was interpreted from 1992 Multi-Resolution Land Cover (MRLC) satellite imagery.

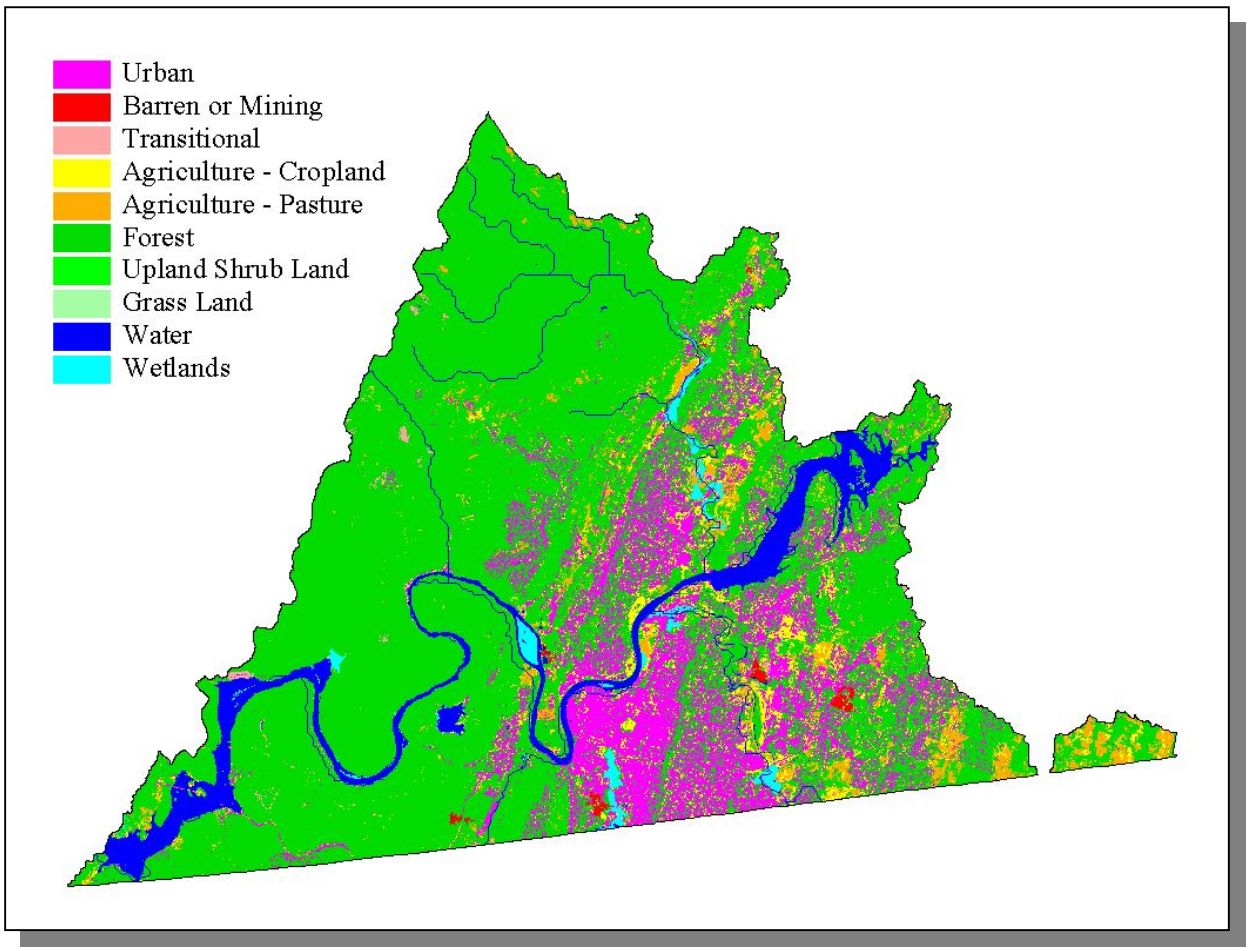

Figure 2-6. Illustration of Select Land Cover/Land Use Data from MRLC Satellite Imagery.

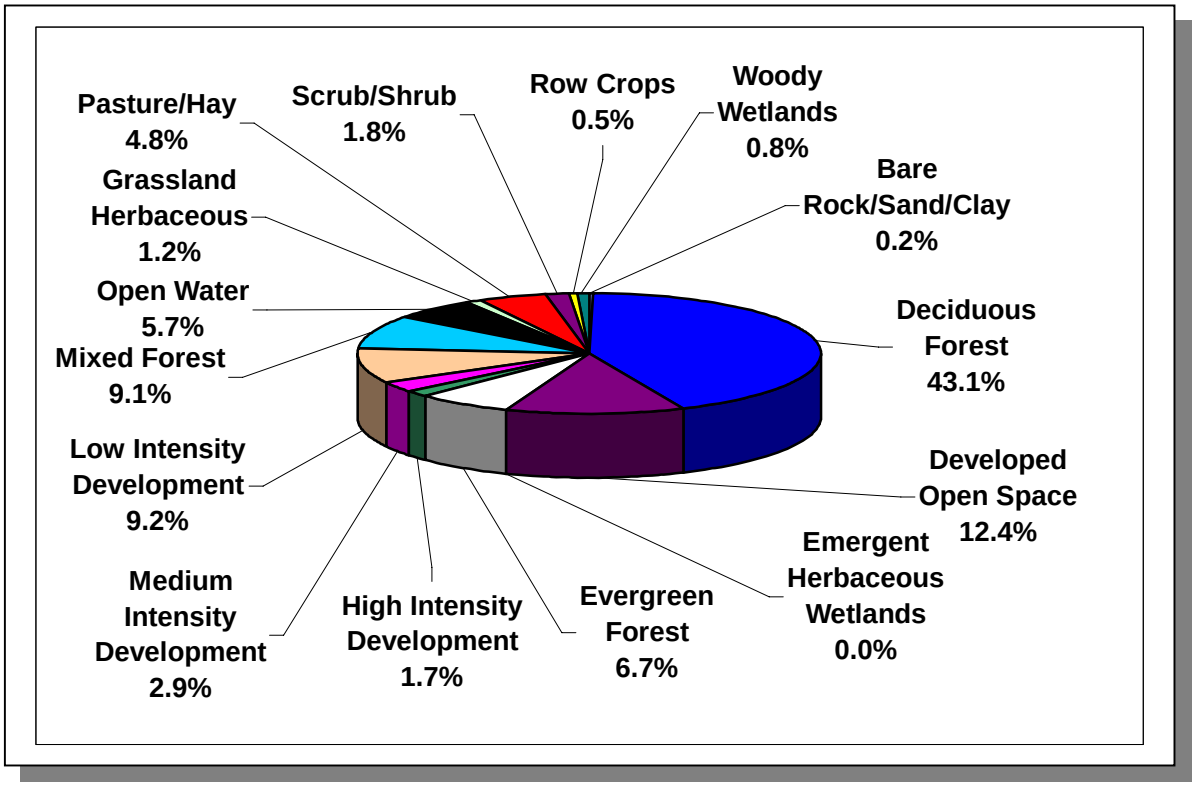

Figure 2-7. Land Use Distribution in the Group 4 Portion of the Tennessee Portion of the Lower Tennessee River Watershed. *More information is provided in Appendix II.*

Sinkholes, springs, disappearing streams and caves characterize karst topography. The term "karst" describes a distinctive landform that indicates dissolution of underlying soluble rocks by surface water or ground water. Although commonly associated with limestone and dolomite (carbonate rocks), other highly soluble rocks such as gypsum and rock salt can be sculpted into karst terrain. In karst areas, the ground water flows through solution-enlarged channels, bedding planes and microfractures within the rock. The characteristic landforms of karst regions are: closed depressions of various size and arrangement; disrupted surface drainage; and caves and underground drainage systems. The term "karst" is named after a famous region in the former country of Yugoslavia.

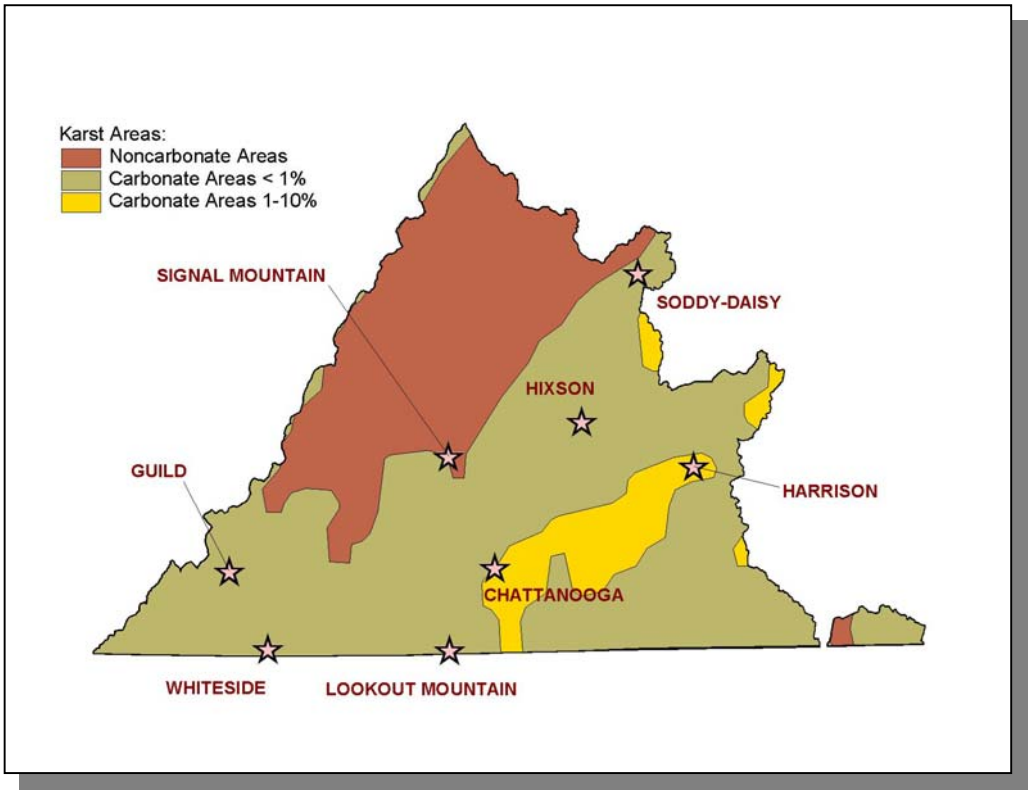

Figure 2-8. Illustration of Karst Areas in the Group 4 Portion of the Tennessee Portion of the Lower Tennessee River Watershed. *Locations of communities in the watershed are shown for reference.*

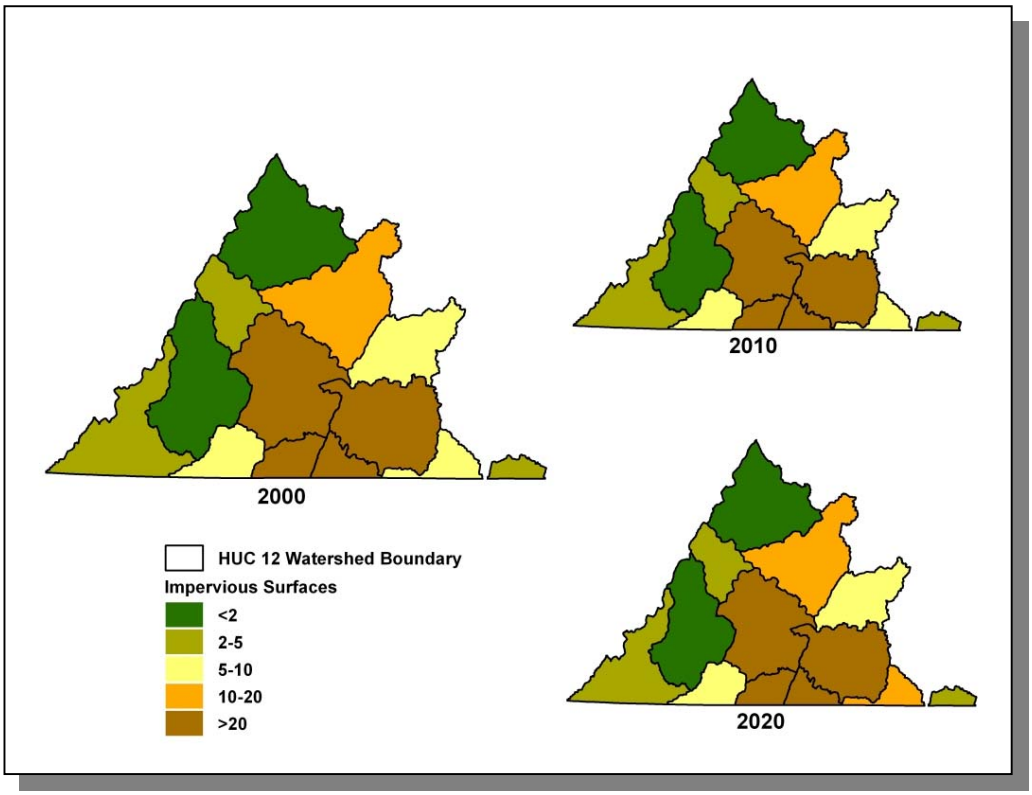

Figure 2-9. Illustration of Total Impervious Area in the Group 4 Portion of the Tennessee Portion of the Lower Tennessee River Watershed. *All HUC-12 subwatersheds are shown. Current and projected total impervious cover is provided by EPA Region 4. More information can be found at: http://www.epa.gov/ATHENS/research/impervious/*

2.5. ECOREGIONS AND REFERENCE STREAMS. Ecoregions are relatively homogeneous areas of similar geography, topography, climate and soils that support similar plant and animal life. Ecoregions serve as a spatial framework for the assessment, management, and monitoring of ecosystems and ecosystem components. Ecoregion studies can aid the selection of regional stream reference sites, identifying high quality waters, and developing ecoregion-specific chemical and biological water quality criteria.

There are eight Level III Ecoregions and twenty-five Level IV subecoregions in Tennessee. The Group 4 portion of the Tennessee portion of the Lower Tennessee River Watershed lies within 2 Level III ecoregions (Ridge and Valley and Southwestern Appalachians) and contains 6 Level IV subecoregions:

- The **Southern Limestone / Dolomite Valleys and Low Rolling Hills (67f)** form a heterogeneous region composed predominantly of limestone and cherty dolomite. Landforms are mostly low rolling ridges and valleys, and the solids vary in their productivity. Landcover includes intensive agriculture, urban and industrial, or areas of thick forest. White oak forests, bottomland oak forests, and sycamore-ash-elm riparian forests are the common forest types, and grassland barrens intermixed with cedar-pine glades also occur here.

- The **Southern Shale Valleys (67g)** consist of lowlands, rolling hills, and slopes and hilly areas that are dominated by shale materials. The northern areas are associated with Ordovician-age calcareous shale, and the well-drained soils are often slightly acid to neutral. In the south, the shale valleys are associated with Cambrian-age shales that contain some narrow bands of limestone, but the soils tend to be strongly acid. Small farms and rural residences subdivide the land. The steeper slopes are used for pasture or have reverted to brush and forested land, while small fields of hay, corn, tobacco, and garden crops are grown on the foot slopes and bottom land.

- The **Southern Sandstone Ridges (67h)** ecoregion encompasses the major sandstone ridges, but these ridges also have areas of shale and siltstone. The steep, forested ridges have narrow crests, and the soils are typically stony, sandy, and of low fertility. The chemistry of streams flowing down the ridges can vary greatly depending on the geologic material. The higher elevation ridges are in the north, including Wallen Ridge, Powell Mountain, Clinch Mountain, and Bays Mountain. White Oak Mountain in the south has some sandstone on the west side, but abundant shale and limestone as well. Grindstone Mountain, capped by the Gizzard Group sandstone, is the only remnant of Pennsylvanian-age strata in the Ridge and Valley of Tennessee.

- The **Cumberland Plateau's (68a)** tablelands and open low mountains are about 1000 feet higher than to the west, and receive slightly more precipitation with cooler annual temperatures than the surrounding lower-elevation ecoregions. The plateau surface is less dissected with lower relief compared to the Cumberland Mountains or the Plateau Escarpment (68c).

Elevations are generally 1200-2000 feet, with the Crab Orchard Mountains reaching over 3000 feet. Pennsylvania-age conglomerate, sandstone, siltstone, and shale is covered by mostly well-drained, acidic soils of low fertility. The region is forested, with some agriculture and coal mining activities.

- The **Plateau Escarpment (68c)** is characterized by steep, forested slopes and high velocity, high gradient streams. Local relief is often 1000 feet or more. The geologic strata include Mississippian-age limestone, sandstone, shale, and siltstone, and Pennsylvania-age shale, siltstone, sandstone, and conglomerate. Streams have cut down into the limestone, but the gorge talus slopes are composed of colluvium with huge angular, slabby blocks of sandstone. Vegetation community types in the ravines and gorges include mixed oak and chestnut oak on the upper slopes, more mesic forests on the middle and lower slopes (beech-tulip poplar, sugar maple-basswood-ash-buckeye), with hemlock along rocky streamsides and river birch along floodplain terraces.

- The **Sequatchie Valley (68b)** is structurally associated with an anticline, where erosion of broken rock to the south of the Crab Orchard Mountains scooped out the linear valley. The open, rolling, valley floor, 600-1000 feet in elevation, is generally 1000 feet below the top of the Cumberland Plateau. A low, central, cherty ridge separates the west and east valleys of Mississippian to Ordovician-age limestones, dolomites, and shales. Similar to parts of the Ridge and Valley (67), this is an agriculturally productive region, with areas of pasture, hay, soybeans, small grain, corn, and tobacco.

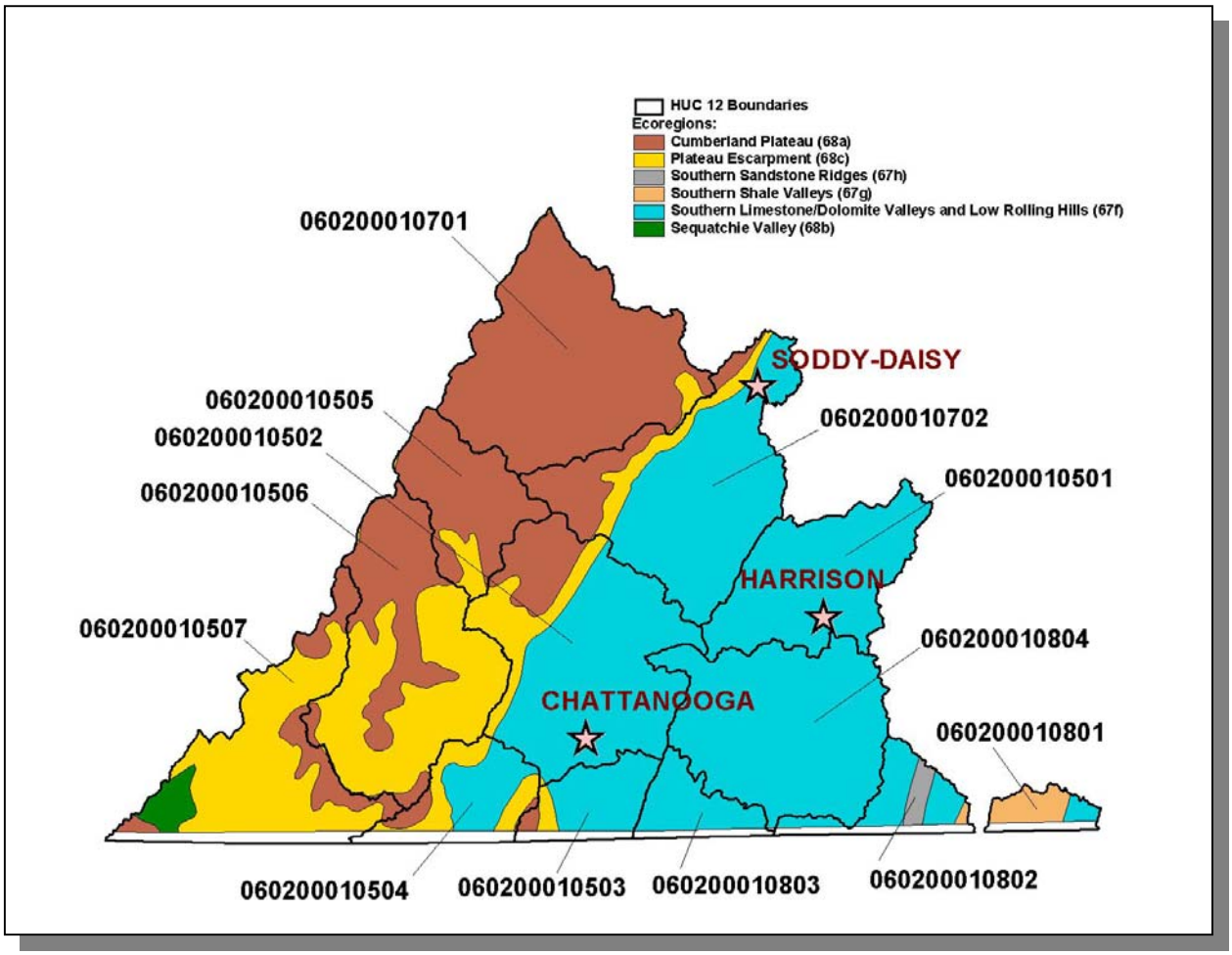

Figure 2-10. Level IV Ecoregions in the Group 4 Portion of the Tennessee Portion of the Lower Tennessee River Watershed. *Locations of Chattanooga, Harrison, and Soddy-Daisy are shown for reference.*

Each Level IV Ecoregion has at least one reference stream associated with it. A reference stream represents a least impacted condition and may not be representative of a pristine condition.

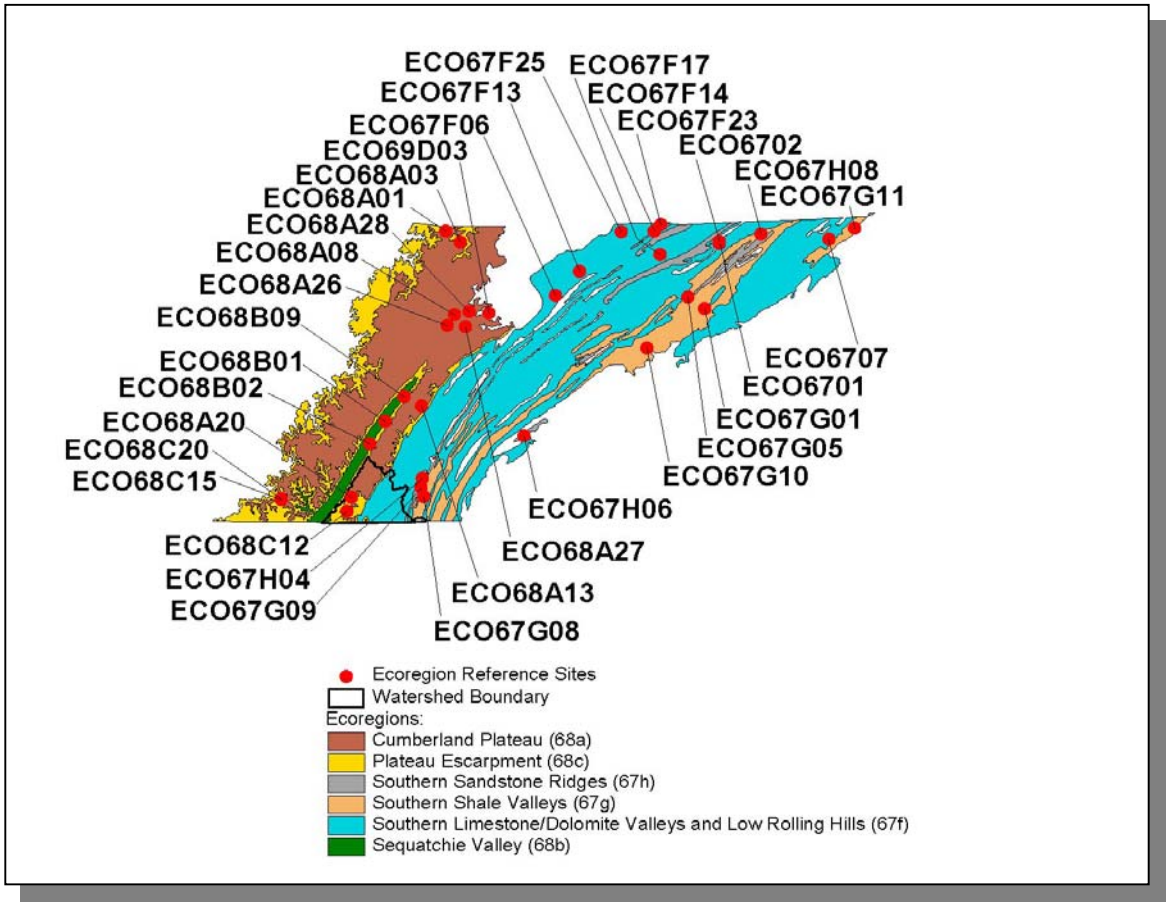

Figure 2-11. Ecoregion Monitoring Sites in Level IV Ecoregions 68a, 68b, 68c, 67h, 67f, and 67g. *The Group 4 portion of the Tennessee portion of the Lower Tennessee River Watershed is shown for reference. More information, including which ecoregion reference sites were inactive or dropped prior to 01/01/2006, is provided in Appendix II.*

2.6. NATURAL RESOURCES.

2.6.A. Designated State Natural Area. The Natural Areas Program was established in 1971 with the passage of the Natural Areas Preservation Act. TDEC/Division of Natural Heritage administers the State Natural Areas program. Further information may be found at http://www.state.tn.us/environment/nh/natareas/

The Group 4 portion of the Tennessee portion of the Lower Tennessee River Watershed has three Designated State Natural Areas:

Falling Water Falls Class I Natural-Recreational State Natural Area is a 136-acre natural area in Hamilton County. It is named for the 110 feet high waterfall on Little Falling Water Creek. The diversity of forestland near a large urban area gives the area even greater significance. A scenic vista of the Tennessee River Valley, Pickett Gulf and Buzzard Point exists at the top of the falls above the 840-feet-high escarpment. Far below, Levi Cave is located at the base of the escarpment slope. A small 2-foot wide hole leads down into a 750-feet-long cave consisting of several large rooms and dripstone formations.

Hicks Gap Class II Natural-Scientific State Natural Area is a 350-acre natural area in Marion County. The natural area occurs along the slopes of the Cumberland Plateau Escarpment in the Tennessee River Gorge just outside of Chattanooga. It is a part of the 26,000-acre Prentice Cooper State Forest and is adjacent to Tennessee River Gorge Trust property known as Kelley's Ferry Slopes. While Hicks Gap is a small site, it is located within a large conservation area deep within the biologically rich Tennessee River Gorge. The gorge is also home to many archeological sites dating back 10,000 years.

North Chickamauga Creek Gorge Class II Natural-Scientific State Natural Area is a 352-acre natural area located in Hamilton County. The creek is a popular kayaking stream during parts of the year. It is also a popular destination for hikers. The natural area is contiguous to the 1,000 acre Bowater owned North Chickamauga Creek Pocket Wilderness and Registered Natural Area on the east side of the creek. It is also contiguous with tens of thousands of gorge in private ownership. The North Chickamauga Conservancy played an essential role in the acquisition and protection of North Chickamauga Creek Gorge.

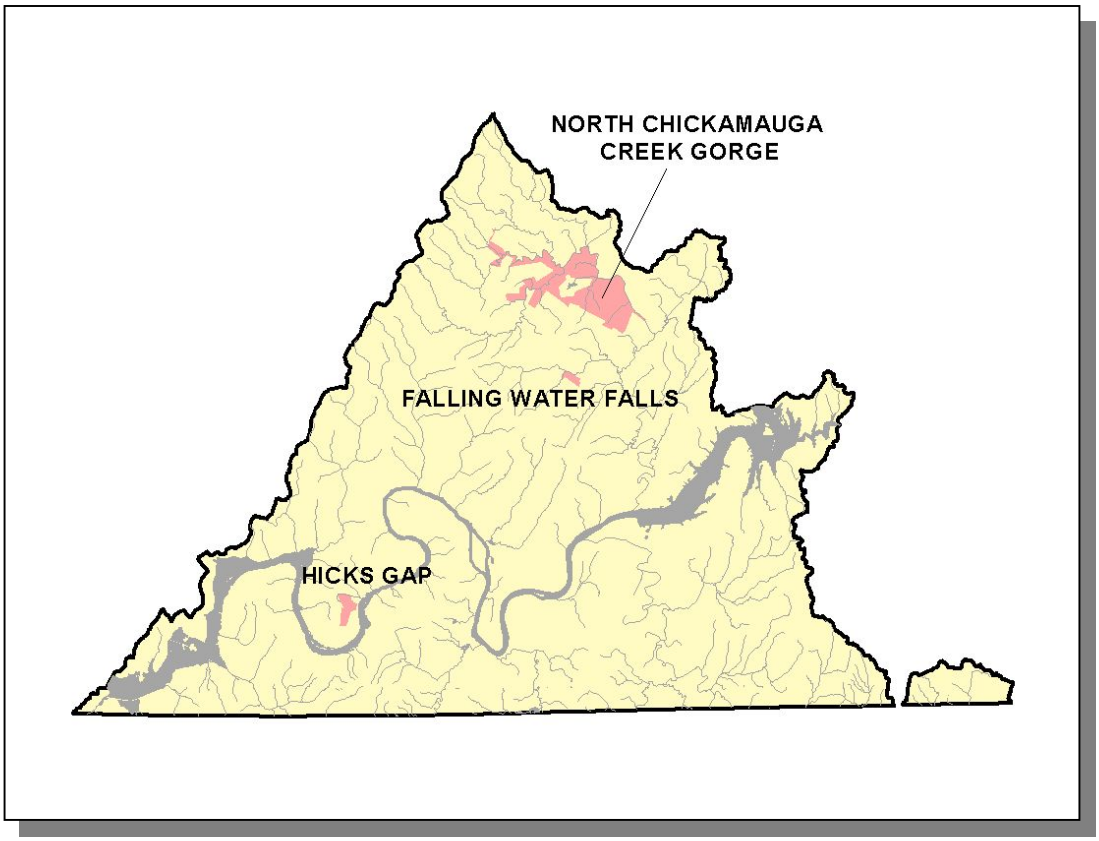

Figure 2-12. There are Three Designated State Natural Areas in the Group 4 Portion of the Tennessee Portion of the Lower Tennessee River Watershed.

2.6.B. Rare Plants and Animals. The Heritage Program in the TDEC Division of Natural Heritage maintains a database of rare species that is shared by partners at The Nature Conservancy, Tennessee Wildlife Resources Agency, the US Fish and Wildlife Service, and the Tennessee Valley Authority. The information is used to: 1) track the occurrence of rare species in order to accomplish the goals of site conservation planning and protection of biological diversity, 2) identify the need for, and status of, recovery plans, and 3) conduct environmental reviews in compliance with the federal Endangered Species Act.

GROUPING	NUMBER OF RARE SPECIES
Crustaceans	3
Insects and Spiders	5
Mussels	8
Snails	1
Amphibians	5
Birds	11
Fish	6
Mammals	6
Reptiles	2
Plants	64
Total	**111**

Table 2-3. There are 111 Known Rare Plant and Animal Species in the Tennessee Portion (Groups 3 and 4) of the Lower Tennessee River Watershed.

In the Tennessee Portion of the Lower Tennessee River Watershed (Groups 3 and 4 portions), there are six known rare fish species, eight known rare mussel species, two known rare snail species, and three known rare crustacean species.

SCIENTIFIC NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS
Carpiodes velifer	Highfin carpsucker		D
Hemitremia flammea	Flame chub		D
Percina tanasi	Snail darter	LT	T
Foxinus saylori	Laurel dace		E
Phoxinus tennesseensis	Tennessee dace		D
Typhlichthys subterraneus	Southern cavefish		D
Cyprogenia irrorata	Eastern fanshell pearlymussel	LE	E
Dromus dromas	Dromedary pearlymussel	LE	E
Lampsilis abrupta	Pink mucket	LE	E
Plethobasus cooperianus	Orange-foot pimpleback	LE	E
Pleurobema oviforme	Tennessee clubshell		
Pleurobema plenum	Rough pigtoe	LE	E
Pleurobema rubrum	Pyramid pigtoe		
Quadrula intermedia	Cumberland monkeyface	LE	E
Io fluvialis	Spiny riversnail		
Apocrangonyx nortoni	Norton's cave amphipod		
Caecidotea nickajackensis	Nickajack cave isopod		
Cambarus extraneus	Chickamauga crayfish		T

Table 2-4. Rare Aquatic Species in the Collins River Watershed. *Federal Status: LE, Listed Endangered by the U.S. Fish and Wildlife Service; LT, Listed Threatened by the U.S. Fish and Wildlife Service. State Status: E, Listed Endangered by the Tennessee Wildlife Resources Agency; T, Listed Threatened by the Tennessee Wildlife Resources Agency D; Deemed in Need of Management by the Tennessee Wildlife Resources Agency. More information may be found at http://www.state.tn.us/environment/na/.*

2.6.C. Wetlands. The Division of Natural Heritage maintains a database of wetland records in Tennessee. These records are a compilation of field data from wetland sites inventoried by various state and federal agencies. Maintaining this database is part of Tennessee's Wetland Strategy, which is described at:

http://www.state.tn.us/environment/nh/wetlands/

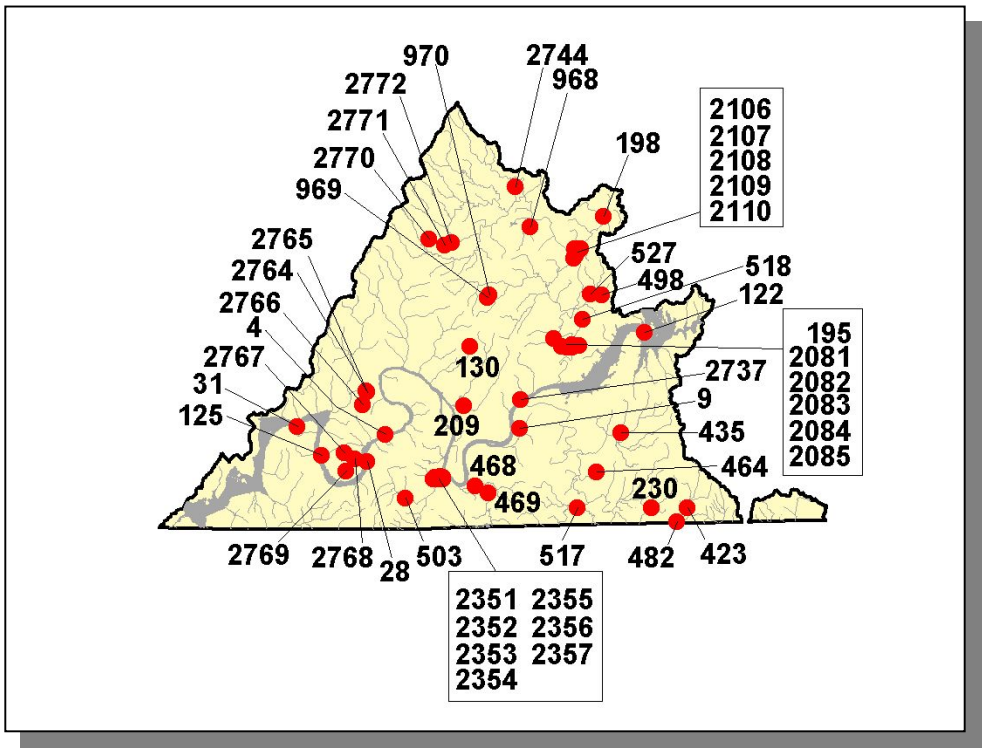

Figure 2-13. Location of Wetland Sites in TDEC Division of Natural Heritage Database in Group 4 Portion of the Tennessee Portion of the Lower Tennessee River Watershed. This map represents an incomplete inventory and should not be considered a dependable indicator of the presence of wetlands. *There may be additional wetland sites in the watershed. More information is provided in Appendix II.*

2.7. CULTURAL RESOURCES.

2.7.A. Nationwide Rivers Inventory. The Nationwide Rivers Inventory, required under the Federal Wild and Scenic Rivers Act of 1968, is a listing of free-flowing rivers that are believed to possess one or more outstanding natural or cultural values. Exceptional scenery, fishing or boating, unusual geologic formations, rare plant and animal life, cultural or historic artifacts that are judged to be of more than local or regional significance are the values that qualify a river segment for listing. The Tennessee Department of Environment and Conservation and the Rivers and Trails Conservation Assistance branch of the National Park Service jointly compile the Nationwide Rivers Inventory from time to time (most recently in 1997). Under a 1980 directive from the President's Council on Environmental Quality, all Federal agencies must seek to avoid or mitigate actions that would have an adverse effect on Nationwide Rivers Inventory segments.

The most recent version of the Nationwide Rivers Inventory lists portions of one stream in the Group 4 portion Tennessee portion of the Lower Tennessee River Watershed:

> North Chickamauga Creek (RM 13 to RM 31) is a spring-fed, crystal clear mountain stream with a variety of flora and abundance of wildlife.

RIVER	SCENIC	RECREATION	GEOLOGIC	FISH	WILDLIFE	HISTIORIC	CULTURAL
North Chickamauga Creek	X	X	X	X	X	X	X

Table 2-5. Attributes of Streams Listed in the Nationwide Rivers Inventory.

Additional information may be found online at http://www.ncrc.nps.gov/rtca/nri/

2.7.B. Public Lands. Some sites representative of the cultural heritage are under state or federal protection:

- Amnicola Marsh Refuge is part of Chattanooga's Tennessee River Park.
- Big Ridge Small Wild Area is a 200-acre tract owned and administered by TVA and registered as a State Natural Area. More information may be found at http://www.northchick.org/greenway.html.
- Booker T. Washington State Recreation Area is a 353-acre state park located on Chickamauga Lake. More information may be found at http://www.state.tn.us/environment/parks/parks/BookerTWashington.
- Chattanooga City Park is owned and operated by the city of Chattanooga. More information on Chattanooga parks may be found at http://www.chattanooga.gov/PRAC/30_955.htm.
- Chickamauga and Chattanooga National Military Park, the nation's first military park, is over 5,000 acres. More information may be found at http://www.nps.gov/chch/.
- Cummings Cove-Aetna Mountain is a 1,200-acre property that the landowner voluntarily placed in conservation protection through the Forest Legacy Program. More information may be found at http://www.na.fs.fed.us/legacy/library/newsletters/03aug_fl.htm.
- Falling Water Falls is a Class I Natural-Recreational State Natural Area located in Hamilton County. More information may be found at http://www.state.tn.us/environment/nh/natareas/fallingwater/.
- Hales Bar Public Use Area is located in Marion County on Nickajack Lake.
- Harrison Bay State Recreation Area is a 1,200-acre state park located on Chickamauga Lake. More information may be found at http://www.state.tn.us/environment/parks/parks/HarrisonBay.
- Hicks Gap is a 350-acre Class II Natural-Scientific State Natural Area located in Marion County and part of Prentice-Cooper State Forest. More information on Hicks Gap State Natural Area may be found at http://www.tennessee.gov/environment/nh/natareas/hicks/.
- Nickajack Dam Public Campground and Access Site is located in Marion County. More information may be found at http://www.tnvacation.com/vendors/nickajack_dam_reservation/.
- Nickajack Lake is a 10,370-acre TVA Lake. More information may be found at http://www.tva.gov/sites/nickajack.htm.

- North Chickamauga Creek Gorge State Natural Area is a Class II Natural-Scientific State Natural Area. More information may be found at http://www.state.tn.us/environment/nh/natareas/northchick/.

- North Chickamauga Creek Wildlife Management Area is a 5,400-acre area managed by TWRA in Hamilton County.

- Prentice Cooper State Forest is a 24,311-acre state forest located in Marion County in the Tennessee River Gorge. More information may be found at http://www.state.tn.us/agriculture/forestry/stateforests/7.html.

- Prentice Cooper State Forest Wildlife Management Area is a 24,000-acre area managed by TWRA in Marion County.

- TDOT Mitigation-Thrasher Tract is located at North Chickamauga Wildlife Management Area and is patrolled by Tennessee Wildlife Resources Agency.

- Volunteer Army Ammunition Plant is part of the federal government's Lands to Parks program. 2757 acres have been deeded to Hamilton County and Chattanooga for public park and recreation use. More information may be found at http://www.nps.gov/flp/tn_volunteeraap_story.htm.

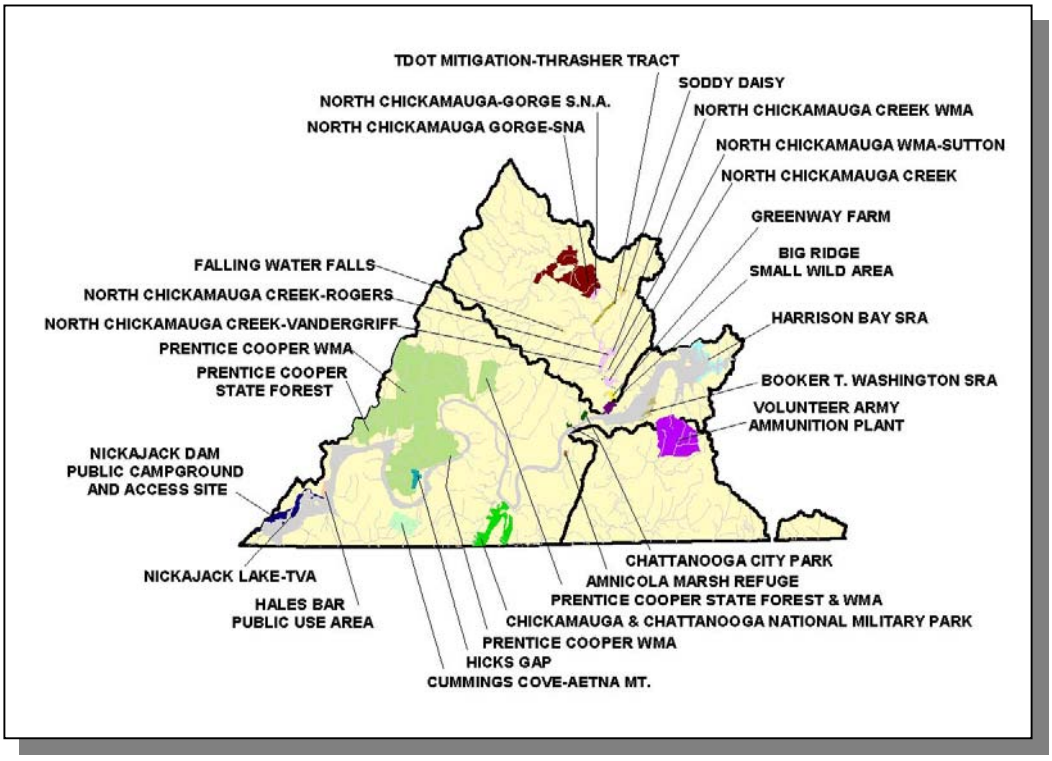

Figure 2-14. Public Lands in the Group 4 Portion of the Tennessee Portion of the Lower Tennessee River Watershed. *Data are from Tennessee Wildlife Resources Agency. SNA, State Natural Area; SRA, State Recreation Area; TDOT, Tennessee Department of Transportation; TVA, Tennessee Valley Authority; WMA, Wildlife Management Area.*

2.8. TENNESSEE RIVERS ASSESSMENT PROJECT. The Tennessee Rivers Assessment is part of a national program operating under the guidance of the National Park Service's Rivers and Trails Conservation Assistance Program. The Assessment is an inventory of river resources, and should not be confused with "Assessment" as defined by the Environmental Protection Agency. A more complete description can be found in the Tennessee Rivers Assessment Summary Report, which is available from the Department of Environment and Conservation and on the web at:

http://www.state.tn.us/environment/wpc/publications/riv/

STREAM	NSQ	RB	RF		STREAM	NSQ	RB	RF
Bear Branch Creek	2				McGill Greek	2	3	
Big Possum Creek	1				North Suck Creek	2	2,3	
Big Sewee Creek	2	2	3,4		Paine Creek	2		
Black Ankle Creek	3				Polebridge Creek	3		
Blue Springs Branch Creek	3				Possum Creek	2	2	
Broad Camp Creek	3				Richland Creek	1	2,3	
Brush Creek	1				Roaring Creek	1,2	2	
Clear Creek	3		3		Rock Creek	1	2	
Dry Fork Creek	3				Sale Creek	3		
Fork Creek	2				Soddy Creek	1	2	
Goodfield Creek	3				South Chickamauga Creek	3	2	
Gray Creek	1				South Fork Little Sewee Creek	2		
Henderson Creek	1	2			South Suck Creek	1		
Hurricane Creek	3				Suck Creek	2	2	
Little Ooltewah Creek	2				Sugar Creek	3		
Little Possum Creek	1	2			Tenmile Creek	3		3
Little Sewee Creek	3		3		Tigues Creek	3	2	
Little Woftever Creek	4				Woltever Creek	3		
Long Savannah Creek	3				Yellow Creek	4		

Table 2-6. Stream Scoring from the Tennessee Rivers Assessment Project in the Group 4 Portion of the Tennessee Portion of the Lower Tennessee River Watershed. *Streams listed may be in the Group 3 or Group 4 portions of the watershed.*

Categories: NSQ, Natural and Scenic Qualities
RB, Recreational Boating
RF, Recreational Fishing

Scores: 1. Statewide or greater Significance; Excellent Fishery
2. Regional Significance; Good Fishery
3. Local Significance; Fair Fishery
4. Not a significant Resource; Not Assessed